SFB 608

Einladung zum Kolloquium

Ort: Universität zu Köln
II. Physikalisches Institut
Seminarraum 201

Zeit: 09. Dezember 2009, 14:30 Uhr s.t.

Sprecher: **Dr. Kai P. Schmidt**
Lehrstuhl für Theoretische Physik I
TU Dortmund

Thema: Anyons as Landau Quasi-Particles –
Kitaev's Toric Code in a magnetic Field

Kitaev's Toric Code is an exactly solvable two-dimensional spin model which is relevant for topological quantum computation [1]. Elementary excitations are abelian anyons which are strictly local due to conservation laws. In the presence of a finite external magnetic field, the anyonic excitations gain a kinetic energy and they start to interact. Using perturbative continuous unitary transformations, we set up a true quasi-particle description of the abelian anyons inside the topological phase [2]. We study one-particle properties like the anyon dispersion but also the formation of bound states including two or more anyon excitations [2][3]. These collective modes turn out to be fermions or bosons. Finally, we study the full phase diagram of the model which turns out to be very rich including multi-criticality and self-duality on different lines in parameter space. The critical properties of the model therefore strongly depend on the direction of the magnetic field. Apart from perturbative continuous unitary transformations we use exact diagonalization as a complentary tool [3].

[1] A. Kitaev, Ann. Phys. (N.Y.) 303, 2 (2003).

[2] J. Vidal, S. Dusuel, and K.P. Schmidt, Physical Review B 79, 033109 (2009)

[3] J. Vidal, R. Thomale, K.P. Schmidt, and S. Dusuel, Physical Review B 80, 081104 (2009) (R)

gez. Grüninger